The Distributional Implications of the Tax Changes in the 1980's

by

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ABSTRACT

Changes in income tax progressivity in the United States as a result of the Economic Recovery Tax Act of 1981 (ERTA), Tax Equity and Fiscal Responsibility Act of 1982 (TEFRA) and Tax Reform Act of 1986 (TRA), is studied over an extended period of time. We improve our understanding by looking at pre-tax and post-tax measures of inequality based on gross household income and disposable household income, respectively. This provides an understanding of the effects of ERTA, TEFRA as well as the TRA. The distribution of income, as well as the tax payments, consist of components that are attributed to tax changes and components which are driven by the pre-tax income. Income tax progressivity indices are generated by using a family of Generalized Entropy measures. The decomposition property of these measures enhance our view of the true implication of income taxes. Thus, decomposition based on quintile, number of exemptions and tax table used are discussed for policy purposes and analysis.

I. INTRODUCTION:

Last decade brought several major tax changes in 1981, 1982, 1985 and again in 1986. These changes were to be implemented over several years. The effects of the these tax changes on the distribution of income over time have not been fully explored. The only discussion to date has been within a static framework: the distribution of pre-tax income at a single point in time (annual income) compared to the distribution of post-tax income at a single point in time. The static approach can mislead the changes in the relative position of individuals and households from the pre-tax distribution to the post-tax distribution of income. Nor does it take into account the effect of the tax changes on incomes in the long-run. It is the objective of this paper to investigate the consequences of these tax changes in a dynamic framework to overcome the problems associated with the static approach. In the process, I will introduce a family of decomposable income tax progressivity measures. My analysis will enable policy makers to have a better understanding of the true effects of these tax changes. This investigation is useful as was apparent from debates over the proposed tax change of 1990.

Tax incidence means the effects that a particular tax or a collection of taxes has on the economic well-being of the tax unit (households or individuals). One of the basic consequences of income taxation is to modify the distribution of income. Generally, the relative economic standing of households will be affected by the tax unless it is proportional. It is an accepted view that progressivity in taxation reduces overall income inequality among households and it is perceived that our taxes are progressive. However a reduction in overall inequality provides only a partial picture in the sense that inequality between certain groups of households (the "between-group" component of inequality1 could be decreasing while inequality among households

in the same group (the "within-group" component of inequality) is rising. Thus, the decomposition of the post-tax inequality moves in a different direction to that of pre-tax decomposition. Thus, when comparing the degree of tax progressivity it is desirable to look at overall inequality as well as its decompositions. Furthermore, decomposition of income tax progressivity could provide additional valuable information relevant for policy purposes. All single-number indices based on the overall measure of inequality suppress detailed information of the underlying distribution.

Changes in the progressivity of the income taxes need to be studied using the Generalized Entropy measures of inequality. With this approach we can investigate changes in the relative position of particular types of households in the distribution of income. A family of mobility measures will be used to associate inequality values with the speed with which incomes tend to be equalized overtime before and after taxes. This is done by looking at income movements in terms of their effect on measured inequality as the measurement period is extended. Thus, mobility measures are related to indices of stability of inequality values over the accounting interval (1977-86). Stability is measured as the ratio of inequality in incomes over time (long-run), and a weighted average of inequalities computed at different points within the period (annual). As the accounting interval is extended, there is a new reference point for the stability profile based on our measured long-run inequality and weighted average of short-run inequalities.

A framework introduced in Maasoumi (1986) and Maasoumi-Zandvakili (1990) is used to provide an appropriate income aggregation procedure so that measurement of long-run inequality and income stability is now possible. Most studies look at a "snap-shot" of the short-run distributions of income and make judgments regarding the changes in inequality. More importantly, this

"snap-shot" approach allows no analysis of the transitory components in short-run inequalities. A stability measure provides an accurate picture of the degree of equalization taking place over time among and across households. Mobility increases the degree of equalization among and across households. Decomposition of stability profiles into the "between-group", and average "within-group" components and a measure of group stability enhances the understanding of the nature of changes in equalization.

This process requires one to define and measure indices of long-run economic well-being. The indices of long-run income treat income at different points in the life cycle as distinct but substitutable attributes. A special case of such indices is linear aggregation. Application of these indices to the Generalized Entropy measures produces a number of familiar inequality measures.

This approach to measurement of tax progressivity is appealing and better than looking at the ratio of the amount of tax paid to the before tax income. It is difficult to imagine an economy with no taxes at all, since there is always some form of public goods and government expenditures. More importantly, such a ratio assumes that nothing else changes after a tax change. For example it is assumed that pre-tax income remains the same with or without the tax system. This is an unreasonable argument. The approach I have subscribed has the capacity to gauge the affects on pre and post-tax incomes.

In this paper I use the household data from the Panel Study of Income Dynamics for the period 1977-86. Short-run inequality, long-run inequality, and income stability before and after taxes will be measured. The long-run measures are free of the transitory components inherent in the short-run measures and thus will be shown to be better for policy purposes and analysis.

These measures are then decomposed and analyzed in order to learn about the effects of the tax changes on the economic well-being of households with specific characteristics. For example decompositions will be based on number of quintile, tax table used and number of exemptions. This has allowed an interpretation of results that could be attributed to any of the above characteristics and components which are free of such group characteristics. The comparison of the pre-tax and post-tax inequality in the short-run, the long-run and the stability profiles will provide insights into the degree of tax progressivity and how it has changed over time.

This paper outlines the methodology for inequality measurement and measurement of income tax progressivity in section II. Sections III through V discuss the overall effects of tax changes and results of decompositions based on income quintile, the tax table used and number of exemptions respectively. Section VI gives conclusions.

II. FRAMEWORK FOR MEASUREMENT

To measure income tax progressivity with insights regarding the treatment of particular sub-groups, we need an index of relative inequality that for any population and its partition, overall inequality can be expressed as a weighted sum of the inequalities calculated for each sub-group and a term summarizing "between-group" inequality. Consequently our choice of index is restricted to the Generalized Entropy measures and they possess the desirable properties of: scale independence, anonymity, the principle of transfer, smoothness, the principle of population, and decomposability (Cowell and Kuga (1981)).

Individual or household income for the tax unit is a measure of economic well-being. It is measured normally for a specific time period. Such a short-run measure is only a "snapshot" of an attribute (income) which is hard

to define and which changes over time. Consider the two individuals with the distributions of [4, 8] and [8, 4] in two consecutive periods. The observed relative inequality in each period has not changed although the individuals have traded their positions in the distribution of income. Short-run measures would show no equalization. The long-run or multi-period inequality has declined, however, as can be seen with a simple linear aggregation of incomes over the two periods which will produce perfect equality. Aggregation techniques are subjective, of course, but the approach used in this study has the flexibility to allow an exploration of the area between the two extremes sketched above.

Income aggregation functions are used as measures of "long-run" income (utility). These functions provide weights for income at different points in time. The aggregate incomes have "distributions" which are close to the annual income distributions. The notion of closeness follows Maasoumi (19861 which is based on information theory. This approach provides an appropriate interpretation for many of the popular utility functions including CES, linear, and Cobb Douglas.

Let Y_{it} denote the income of household i = 1, . . .,N in period t = 1, ...T. Allow $S_i = S_i(Y_{i1}, Y_{i2}, \ldots, Y_{iM})$ to represent aggregate income over any sub period $M \leq T$ such that:

$$S_i = [\Sigma_t \phi_t Y_{it}^{-\beta}]^{-1/\beta} \qquad \beta \neq 0 \text{ or } -1 \tag{1a}$$

$$= \Pi_t Y_{it}^{\phi_t} \qquad \beta = 0 \tag{1b}$$

$$= \Sigma_t \phi_t Y_{it} \qquad \beta = -1 \tag{1c}$$

where ϕ can be regarded as income weight for each period, such that $\Sigma_t \phi_t = 1$. The constant elasticity of substitution of income over time is $\sigma = 1/(1+\beta)$. The family of measures employed to compute inequality is the Generalized Entropy denoted by GE. These measures of inequality satisfy the "fundamental welfare axioms" exemplified in Cowell and Kuga (19811 and Foster (19831. Maasoumi (1986) develops multi-period or attribute inequality measures using the aggregate income shares $S^* = (S_1^*, \ldots, S_N^*)$ and $S_i^* = S_i / \Sigma_{ij} S_j$ and a GE approach as given below:

$$(2a) \qquad I_\gamma(S) = \Sigma_i [(NS_i^*)^{1+\gamma} - 11 \; / \; N\gamma(1+\gamma) \qquad \gamma \neq 0, -1$$

$$(2b) \qquad = \Sigma_i S_i^* \text{Log}\,(NS_i^*) \qquad \gamma = 0$$

$$(2c) \qquad = \Sigma_i \; N\text{-}^{\text{l}}\log\,(1/NS_i^*) \qquad \gamma = -1$$

This family includes Theil's (19671 information measures as I_0 and I_{-1}. γ is the degree of inequality aversion. For every γ there exists a different index. By using a number of different γ's, we can test the sensitivity of measured inequality to the choice of index. The differences in the nature of decomposability sets these measures apart from each other. For example, I_{-1} is different from I_0 in that it is weighted by population shares rather by income shares. Thus, I_{-1} might be better than I_0 if the nature of analysis is such that population shares are preferred to income shares. The latter is sensitive to distributional changes.

The usefulness of the additive decomposition property of Generalized Entropy measures in this context is discussed in Maasoumi-Zandvakili (1990). For example Theil's second measure of inequality can be decomposed to:

(3) $$I_{-1} = I_{-1}(S.) + \Sigma_r P_r I_{-1}(S^r)$$

where Pr is the population share of the rth group, $r = 1,..,G$. Note that S^r is the rth group's share vector and S. is the vector of group means. The first term on the right is the "between-group" component of the measured inequality. The second term is a weighted average of "within-group" inequalities.

These measures include monotonic transformations of measures proposed by Atkinson (1970):

(4) $$I_\epsilon(y) = 1 - \left[1/n \quad \Sigma_i (ny_i)^{1-E} \right]^{1/(1-\epsilon)} \qquad \text{for } \epsilon \geq 0$$

It is evident that $I_\gamma(y)$ and $I_\epsilon(y)$ are ordinarily equivalent for values of $\epsilon = -\gamma > 0$. Also for $\gamma > 0$ Atkinson measures do not correspond to $I_\gamma(y)$.

To measure stability over $M \leq T$ periods, the corresponding long-run inequality $I_\gamma(S)$, and a weighted average of short-run inequalities, $\Sigma_t \alpha_t I_\gamma(Y_t)$, are calculated. A measure of stability (mobility) over the M periods is derived from the following relationship:

(5) $$R_M = I_\gamma(S)/\Sigma_t \alpha_t I_\gamma(Y_t)$$

where $Y_t=(Y_{1t}, Y_{2t}, \ldots, Y_{Nt})$ is the income vector at time t. For some S_i, the restriction $0 \leq R_M \leq 1$ holds for all convex measures $I(.)$ and $\Sigma_t \alpha_t = 1$. This restriction holds for other functions following the propositions 1 and 2 in Maasoumi (1986) such that $-\gamma = (1+\beta)$. Definition (3) generalizes Shorrocks (1978). As M approaches T, the profile generated by R_M reflects changes in

the distribution of income (stability). The choice of $I_\gamma(S)$ affects, of course, the computation of R_M. Inequality measures vary in their sensitivity to transfers in the distribution of income. In order to analyze this sensitivity, as well as the role of aggregation method, we use several inequality measures and aggregation methods. Furthermore, R_M can be decomposed accordingly into the "between-group" and a weighted average of "within-group" component such that $R_M = R_b + R_w$. A group-specific stability profile can be computed as well from the following expression:

$$(6) \qquad R_r = I_\gamma(S^r)/\Sigma_t \alpha_{tr} I_\gamma(Y_t^r)$$

where the income share of the ith household in the rth group at time t is Y_{tri} with the relative weights given as $a_{tr'}$ Similarly $0 \leq R_r \leq I$.

The measurement of tax progressivity can be approached from (a) the concentration index, or (b) inequality index. The former approach in the measurement of progressivity can be seen in: 1) Effective Progression, Musgrave and Thin (19481; 2) The Pechman-Okner Index, Pechman and Okner (1980); 3) The Reynolds-Smolensky Index, Reynolds and Smolensky (1977); 4) The Khetan Poddar Index, Khetan and Poddar (1976); 5) The Kakwani Index, Kakwani (19771; 6) The Khetan-Poddar-Suits Index, Khetan and Poddar (19761. The above progressivity indexes are all based on the Gini index and concentration indexes. Lambert (1989) provides, a general discussion of each of the above.

As we know the Gini index does not satisfy some desirable social welfare axioms, see Atkinson (1970) and Sen (1973). The latter approach assumes the existence of a social welfare function, and uses the concept of an "equally distributed equivalent" introduced in Atkinson (1970). Using Atkinson's family of measures the redistributive effect in the short-run gauged by

looking at the pre-tax and post-tax income distribution. Consider the progressivity index:

$$(7) \qquad P_\epsilon = I_\epsilon(S_g) - I_\epsilon(S_d)$$

introduced by Kiefer (19851, where $_g(S)$ and (S_d) are gross and disposable incomes respectively. If $P_\epsilon > 0$, the tax is progressive; if $P_\epsilon = 0$, the tax is proportional; and if $P_\epsilon < 0$, the tax is regressive. P_ϵ is an indicator of the amount by which the tax system has increased the equally-distributed equivalent income, given a social welfare function.

An alternative approach is that introduced by Blackorby and Donaldson (1983) and it is given as:

$$(8) \qquad P^*_\epsilon = I_\epsilon(S_g) - I_\epsilon(S_d)/\left[1 - I_\epsilon(S_g)\right]$$

This index is normalized to zero and considers the percentage change. Thus if $P^*_\epsilon > 0$, the tax is progressive; if $P^*_\epsilon = 0$, the tax is proportional; and if $P^*_\epsilon < 0$, the tax is regressive.

In the spirit of Kiefer (1985), I will measure income tax progressivity using the Generalized Entropy family of measures. Consider:

$$(9) \qquad I^* = I_\gamma(S_g) - I_\gamma(S_d) \ ,$$

If $I^* > 0$, the income tax is progressive and the income tax is regressive, if $I^* < 0$. This type of measure does not account for reranking of households as taxes are imposed. For example, given the pre-tax distribution as [2,5], and the distribution of post-tax income as [3,4] or [4,3] the overall index of tax

progressivity does not account for the fact that in the latter case the individuals have traded places. Thus, the true effect of such an income tax is hidden. However, since Generalized Entropy measures are decomposable by sub-groups, the true effect of such a tax can be identified. I* can be shown as:

$$(10) \qquad I^* = I^{b*} + I^{w*}$$

where I^{b*} is the difference of the pre-tax and post-tax "between-group" component of income inequality, while I^{w*} is the difference of average "within-group" inequality before and after taxes. The proportion of change in I* due to I^{b*} is:

$$(11) \qquad D^b = I^{b*} / \left[I_\gamma(S_g) - I_\gamma(S_d) \right]$$

while the proportion attributed to the changes "within-group" is:

$$(12) \qquad D^w = I^{w*} / \left[I_\gamma(S_g) - I_\gamma(S_d) \right]$$

Thus, by definition $D^w + D^b = 1$. Equations (12) provides valuable information which can enhance our understanding of the impact of taxes. This information is disregarded if one does not perform the decompositions.

For policy purposes it is very crucial to pay attention not only to the overall measures and their decompositions, but also to the implication of taxation in each group. The decomposition of the overall measure is a good guide as to the importance of the "within-group" results. If the average "within-group" component of the overall inequality constitutes a substantial

portion of the overall inequality, it is important to analyze pre-tax and post-tax inequality for each group as well. Thus, for each characteristic type (number of earners and family size) the population is divided into sub-groups. Let there be r groups, $r=1,\ldots,G$. For each group we measure tax progressivity by:

$$(13) \qquad I^*_r = I_\gamma (S^r_g) - I_\gamma (S^r_d)$$

where the first term in the right hand side is inequality in group r based on pre-tax income and the second term is inequality for the same group based on disposable income. If the value of I^*_r is shown to move in the opposite direction of I* one must pose a number of question regarding the efficiency of the tax system.

III. THE OVERALL EFFECT OF THE TAX CHANGES

There has been a number of tax changes in the 1980's. In order to understand the impact and the magnitude of these changes, we need to follow the same households (tax units) over time. This requires using panel data. Unfortunately, Internal Revenue Service does not provide a panel on individual tax units. I am using the Panel Study of Income Dynamics for the duration of 1977-86. My first objective is to smooth the effect of transitory components on income over time so that the impact of the tax change can be gauged more efficiently. The initial period from 1977 to 1980 should be long enough to smooth out most of the transitory variation in incomes. Within this data set, same households are traced overtime. Thus, our population does not change for the entire duration. Furthermore, the weights provided in the 1987 data set are used to make the sample representative of the United States as of 1986. Please note that the results provided here are representative of the United

States population to the extent that PSID is representative of the population. It is anticipated that with panel data there must be *some* attrition overtime, as well as changes in family composition. Thus, our panel might be different from that of the population. As a result there might be some loss in efficiency.

In order to measure tax progressivity, I have calculated pre- tax and post -tax inequality both in the short-run and long-run incomes. The overall inequality in the short-run and long-run based on four different values of γ is measured, of which only two are reported in table 1 (-1.0 and 0.0). These two are the familiar Theil's measures of inequality. From the observed inequality I have measured tax progressivity based on annual income as well as long-run incomes. There are some interesting patterns and inconsistencies that need to be explored.

First part of table 1 reports results based on annual incomes from 1977-86 for the two values of γ. Short-run inequality based on pre and post-tax has had an increasing pattern with some fluctuations over the ten years. As expected, post-tax short-run inequality is always smaller than pre-tax short-run inequality. This is due to the progressive nature of the tax system. The extent to which taxes are progressive in the short-run is denoted by I*. It is evident that not only taxes are progressive but also have changed over the years. Please note that our observation is sensitive to the choice of inequality measure. As γ approaches zero, the observed inequality and tax progressivity are generally smaller. However, the patterns generally remain unchanged.

The impact of a tax change has to be analyzed in two different manners. First, pre-tax inequality has increased from 1981 to 1982. This is partly due to adjustment to tax changes as some households take advantage of such

changes. Second, the post-tax inequality is smaller than pre-tax inequality in each year. However, this reduction in 1982 is smaller than 1981, thus revealing a reduction in the progressivity from one year to the next. The awareness of the direction of such changes is of great importance however it might be distorted. Looking at 1980 and 1981 results, one can conclude that tax changes have brought about more progressivity? It is evident that such tax changes increased inequality in pre-tax distribution while reducing inequality in the post-tax distribution for γ = -1.0. As I have argued before, these observations contain transitory components and one should be cautioned about their reliability. Furthermore, consider [5,2] and [4,3] as the pre and post-tax distributions. It is obvious that tax are progressive. However if the post-tax distribution was [3,4], one would have come up with the same conclusion! One can construct complex examples with constriction in short-run observations.

We now turn to long-run analysis, which I believe is a better reflection of the effect of tax changes. This is a more efficient approach because the transitory components are smoothed out. Experience has shown that within the first three to four periods, most of the transitory components are smoothed out. Also I have experimented with a number of approaches for weighting income at different points in time and generally the results are insensitive to the choice of weights used. The current results are based on equal income weights. Looking at the second part of table 1, measures of long-run inequality for 10 different accounting intervals are provided. The first accounting interval is identical to the short-run inequality for 1977. As accounting interval is extended, our measure of inequality contains a longer duration.

The pre-tax long-run inequality, after some initial fluctuations, has had

a rising trend. The post-tax inequality has generally had the same pattern. However, the magnitude as well as the direction of such changes are sensitive to our choice of γ. As was shown before, lower values of γ show lower observed long-run inequality. Initially, observed inequality in pre and post-tax incomes is decreasing for Theil's second measure (-1.01, while it is increasing for Theil's first measure (0.0). This is due to the fact that these measures are sensitive to different portions of the distribution. After the initial periods, the patterns are generally similar.

Looking at tax progressivity, it is evident that that they have decreased over the last ten years. Initially, some of the fall could be due to the existence of transitory components. If we concentrate on the last six accounting intervals, I* has decreased from .049 to .044 and .045 to .039 for the two choices of inequality measures respectively. Note that this pattern is uniform and consistent over time. This is far different from what we observed under short-run analysis. Short-run observations provided a distorted picture of the observed patterns.

It is obvious that the tax changes of 1981, 1982 and 1985 have made the distribution of both pre and post-tax incomes more unequal. Thus, we have less progressivity in our tax structure and they have continued to be less progressive over time. What is not evident from the net effect of such tax changes is its impact upon different tax units. In what follows I will provide a framework where we can verify the manner different tax units have been affected.

IV. ANALYSIS BY QUINTILE

It has been customary for most analyst to look at the distribution of the pre and post-tax income by quintile based on Gini coefficient. It has been demonstrated in the literature that Gini is least sensitive to the two tails

of the distribution. In the study of taxation, it is intuitive to expect that most of the activity is at the two tails. Thus, Gini is inappropriate for measurement and analysis. Also, one needs to measure pre and post-tax inequality with a decomposable measure so that the analyst can differentiate the effect of the tax "between" and "within" the groups under study. This limits our choice to the Generalized Entropy measure. To save space I will limit my discussion to Theil's second measure for γ = -1.0. Results based on several other members of this family are available from the author.

For the purpose of the decompositions, there are five groups. Group 1 through group 5 contains tax units with the least to the highest earning for the entire 10 years based on pre-tax income. This same ranking is used for the decomposition of the post-tax inequality. This procedure insures the same population in each group for comparison. There are 3033 observations, thus each group contains about 600 households.

Table 2A provides the decomposition of short-run inequality based on quintile for pre and post-tax inequality. Column 3 and 4 provide the "between-group" and a weighted average of "within-group" inequality. Columns 5 through 9 provide group specific results. A measure of short-run income tax progressivity and its decomposition as well as group specific income tax progressivity is provided at the bottom of table 2A. From our decompositions, one can conclude that generally the "between-group" component of the overall inequality is greater than the "within-group" component. This is the case for both pre and post-tax inequality. As was discussed above there is less income tax progressivity after 1981. The decomposition by quintile reveals that the "between-group" component of the reduction in inequality has been increasing from one period to the next. From policy point of view, it is desirable to see the "between-group" component to be greater if our goal is to compress the

distribution. It is only now that we can verify whether in fact we have achieved our goal. By analyzing the overall income tax progressivity, it is impossible to evaluate particular policy goals.

It is also shown that the "within-group" component of the income tax progressivity has become smaller overtime. Looking at tax progressivity for specific groups, it is evident that most of the observed inequality is between groups. Thus, we should expect a tax policy that will reduce inequality across groups. Only the quintiles at the two extremes show progressivity of taxes within their respective groups. If anything, the change in tax policy has shifted its emphasis toward more progressivity "between groups." If we look closely at the tax progressivity in the long-run incomes, it is shown that the "between-group" component constitutes an even larger component of the tax progressivity. Thus, the shift in emphasis is even more apparent as shown in table 2B. This shift is strong enough that after the tax change of 1981, we do not see much activity within the middle three quintiles for 1981-86. The only "within-group" progressivity is detected for the richest and the poorest.

It is further interesting to note, that these tax changes over time have brought about less progressivity and less equalization over time. This is shown in table 2C by our measure of stability, For the bottom four quintiles we observe more equalization in pre-tax income than post-tax income. Only the richest quintile shows more equal jzation from pre to post-tax income. Thus, we detect less income tax progressivity, and minimum amount of cross-group equalization.

IV. THE CHOICE OF TAX TABLE

One of the basic features of the current tax structure is the category in which one must use in order to file for taxes. Different tax rate schedules

are provided in present law for each of the filling status classifications: (1) single individuals; (2) heads of household; (3) married individuals filing jointly and certain surviving spouses; and (4) married individuals filing separately. There are three basic categories under consideration for our purpose due to the limitation in the PSID. The individual tax unit are categorized under single, married (joint or separate) or heads of household. As a policy analyst, it is crucial to know whether these three types of tax units are in fact treated differently. Is it our policy objective to bring about more equalization among tax units sharing the same feature? This is reasonable to expect, and that is why we have subscribed to a progressive income tax structure. More importantly, can we verify whether the above objective has been achieved.

In tables 3A, 3B and 3C decomposition of the overall short-run inequality, long-run inequality and income stability based on the tax table the individual tax units have used has been provided. Each table follows the same format as those provided in section III. As it has become apparent, the short-run results are potentially distorted and should be used with caution. Thus I will limit my analysis only to the long-run results.

Overall long-run inequality (both in pre and post-tax income) has had a rising trend after the initial smoothing took place. Most of this rise has been within two of the groups. While those in single and married category have experienced a rise in inequality among themselves, those in the head of household group have experienced a uniform decrease in inequality over time. This does not suggest that those in the head of household group have lower income tax progressivity. It is possible that such tax changes have made those in the head of the household group better off compared to other groups, and at the same time has brought about more “within-group” equalization.

As a result of the tax changes we have experienced over the early part of last decade, the nature of income tax progressivity within each group has changed. First, most of progressivity has been "within-group." For example, by 1986 over 95% of the equalization is experienced within each group. This is good only if that is our goal. Thus, there appears to be minimal cross-group equalization as a result of income tax progressivity.

Second, each of the three groups vary in the degree to with income taxes are progressive among group members. Following the patterns of overall income tax progressivity, "within-group" income taxes have become less progressive. Those-filing-as-single are generally subject to higher income tax progressivity. They are followed by head of households and married tax units. *There* appears to be less tax burden upon married tax units over time. Is this clear advantage desirable? I would like to reserve the judgment regarding the desirability of such structure. This structure and its consequence are only good if that was our original intention. "Within-group" results suggest that while both pre and post-tax inequality has been increasing for tax units under the single and married category, taxes for particular groups have become less progressive as well.

V. NUMBER OF EXEMPTIONS AND THE DISTRIBUTION OF EARNINGS

In the current tax structure, one can take advantage of adjustments for number of exemptions based on the size of tax unit. It is an accepted view that there should be differential treatment of tax units based on the number of individuals in the unit whose welfare is dependent upon these earnings. Assuming that such a policy is appropriate, it is important to be able to verify that in fact this objective has been achieved. In order to verify that in fact the nature of the income tax structure brings about more equality and at the same time has brought about more "within-group" equalization.

redistributive effect between tax units of different size should be observed,

The personal exemptions and standard deductions has declined in real terms over the last few decade. The Tax Reform Act of 1986 increased the personal exemptions from $1080 in 1986 to $2000 by 1989. From 1977 to 1986 a moderate rise in the exemptions was observed as well. The consequence of changes beyond 1986 can not be considered here due to data limitation. However, I believe that the decline in the value of the exemption over the period has contributed to the loss in progressivity in the income tax system. I believe for exemptions to be meaningful, they must be a credit against the tax. Under such condition for those in the higher income brackets with higher marginal tax rates, the exemptions would be worth much less.

For the purpose of our analysis, there are five different groups. Groups one through four have one to four exemptions respectively. Group five contains those tax units with five or more exemptions. Tables 4A, 4B and 4C provide short-run, long-run and income stability results for pre and post-tax incomes. As I have argued before, the short-run results are distorted and a number of contradictions can be identified compared with the long-run results.

Looking at Table 4B, it is evident the "between-group" component of the overall income tax progressivity is minimal and the "within-group" component contains nearly 100% of the overall reduction due to the progressivity of the income tax structure. This is at a time that income taxes are less progressive. It is evident that the impact of the income tax structure is within each group. If our goal has been to achieve *more* equalization within each group, we have been successful. Furthermore, the level of income tax progressivity is different from one group to the next. However, the pattern is similar for all groups. All of them show a reduction of income tax progressivity. Also, groups 2 and 4 experience a level of progressivity which

is much higher than the overall income tax progressivity. Group 2 potentially contains a number of two earners without dependents. This could increase the variance of earnings for the group.

It is evident from our results that the observed inequality is to a large extent among tax units of similar size. The changes of tax structure has brought about more inequality in groups 2, 3 and 4. At the same time groups 2 and 4 experience some of the highest income tax progressivity (although the income tax progressivity is falling over time). Also, it is expected to observe lower inequality among larger tax units with up to four exemptions. This is due to the economies of scale. However, this is not observed here.

VI. CONCLUSIONS

A family of income tax progressivity measures for the purpose of policy analysis are introduced. This family has two unique features. First, they consider income tax progressivity in the long-run. Second, they can be decomposed into "between" and a weighted average of "within-group" components. This added feature is useful in verifying specific policy objectives.

This methodology is used to analyze the changes in the income tax progressivity in the United States from 1977-86. It has been shown that long-run income tax progressivity has been declining over time. At the same time we have experienced a rise in pre and post-tax income inequality over the latter portion of accounting interval. It is further shown that number of exemptions and the type of tax table used bring about more equalization within each group but cross-group equalization is minimal. The decomposition by quintile reveals more cross-group equalization than "within-group" equalization. This process has provided a better approach to evaluate the policy objectives of tax changes.

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TABLE 1
ANALYSIS OF ANNUAL AND LONG TERM TAX **PROGRESSIVITY**

Annual analysis:										
	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986
γ = -1.0										
S	.323	.345	.330	.365	.367	.392	.386	.425	.459	.507
$S_d^{\sim}$	.266	.281	.285	.312	.311	.341	.337	.384	.416	.463
I*	.057	.064	.045	.053	.056	.051	.049	.041	.043	.044
γ = 0.0										
S	.236	.283	.264	.302	.303	.347	.308	.363	.367	.383
$S_d^{\sim}$	.183	.220	.227	.253	.253	.308	.263	.323	.324	.341
I*	.053	.063	.037	.049	.050	.039	.045	.040	.043	.042
Long-run **analysis:**										
	1	2	3	4	5	6	7	8	9	10
γ = -1.0										
S	.323	.317	.307	.309	.309	.309	.306	.313	.319	.326
$S_d^{\sim}$	.266	.259	.256	.259	.260	.261	.260	.268	.274	.282
I*	.057	.058	.051	.050	.049	.048	.046	.045	.045	.044
γ = 0.0										
S	.236	.245	.240	.246	.248	.257	.254	.260	.265	.269
$S_d^{\sim}$	.183	.189	.193	.200	.203	.215	.213	.221	.226	.230
I*	.053	.056	.047	.046	.045	.042	.041	.039	.039	.039

TABLE 2A

1977-86, PRE AND POST-TAX INEQUALITY BY QUINTIL, γ= -1.0

	OVERALL	BETWEEN	WITHIN	GROUP1	GROUP2	GROUP3	GROUP4	GROUP5
pre-tax short-run inequality								
1977	0.322	0.151	0.172	0.474	0.120	0.107	0.068	0.089
1978	0.345	0.191	0,154	0.403	0.121	0.071	0.054	0.121
1979	0.330	0.196	0.135	0.383	0.104	0.049	0.039	0.099
1980	0.365	0.223	0.142	0.398	0.106	0.052	0.032	0.124
1981	0.367	0.235	0.133	0.375	0.098	0.042	0.038	0.111
1982	0.391	0.259	0.132	0.343	0.101	0.056	0.035	0.126
1983	0.386	0.260	0.126	0.352	0.099	0.051	0.028	0.097
1984	0.425	0.274	0.151	0.388	0.120	0.064	0.042	0.139
1985	0.459	0.289	0.170	0.432	0.155	0.073	0.054	0.136
1986	0.507	0.284	0.223	0.514	0.200	0.147	0.101	0.154
post-tax short-run inequality								
1977	0.266	0.121	0.145	0.434	0.100	0.085	0.052	0.054
1978	0.281	0.150	0.131	0.372	0.102	0.058	0.038	0.084
1979	0.285	0.165	0.119	0.354	0.088	0.041	0.032	0.082
1980	0.312	0.185	0.127	0.371	0.092	0.044	0.025	0.101
1981	0.311	0.193	0.118	0.348	0.086	0.034	0.030	0.090
1982	0.341	0.222	0.119	0.319	0.088	0.047	0.029	0.114
1983	0.337	0.224	0.113	0.333	0.087	0.044	0.024	0.077
1984	0.384	0.242	0.142	0.376	0.111	0.064	0.037	0.122
1985	0.416	0.256	0.160	0.420	0.144	0.070	0.048	0.116
1986	0.463	0.249	0.214	0.498	0.195	0.148	0.095	0.133
short-run tax progressivity								
	If	D^b	D^w	G1	G2	G3	G4	G5
1977	0.056	0.536	0.482	0.040	0.020	0.022	0.016	0.035
1978	0.064	0.641	0.359	0.031	0.019	0.013	0.016	0.037
1979	0.045	0.689	0.356	0.029	0.016	0.008	0.007	0.017
1980	0.053	0.717	0.283	0.027	0.014	0.068	0.007	0.023
1981	0.056	0.750	0.268	0.027	0.012	0.008	0.008	0.021
1982	0.050	0.740	0.260	0.024	0.013	0.009	0.006	0.012
1983	0.049	0.735	0.265	0.019	0.012	0.007	0.004	0.020
1984	0.041	0.780	0.220	0.012	0.009	0.000	0.005	0.017
1985	0.043	0.767	0.233	0.012	0.011	0.003	0.006	0.020
1986	0.044	0.795	0.205	0.016	0.005	-0.001	0.006	0.021
Sample size 3033								

TABLE 2B

1977-86, PRE AND POST-TAX INEQUALITY BY QUINTIL, γ= -1.0

	OVERALL	BETWEEN	WITHIN	GROUP1	GROUP2	GROUP3	GROUP4	GROUPS
pre-tax long-run inequality								
1977-	0.322	0.151	0.172	0.474	0.120	0.107	0.068	0.089
1977-78	0.317	0.174	0.142	0.394	0.104	0.076	0.051	0.086
1977-79	0.307	0.185	0.122	0.352	0.085	0.05-F	0.037	0.079
1977-80	0.309	0.200	0.110	0.322	0.074	0.044	0.029	0.080
1977-81	0.309	0.212	0.097	0.292	0.062	0.033	0.022	0.078
1977-82	0.309	0.223	0.086	0.263	0.046	0.024	0.018	0.077
1977-83	0.306	0.231	0.075	0.242	0.036	0.018	0.014	0.068
1977-84	0.313	0.242	0.072	0.236	0.029	0.013	0.011	0.069
1977-85	0.319	0.250	0.069	0.232	0.025	0.010	0.008	0.069
1977-86	0.326	0.257	0.069	0.234	0.025	0.009	0.007	0.069
post-tax long-run inequality								
1977-	0.266	0.121	0.145	0.434	0.100	0.085	0.052	0.054
1977-78	0.259	0.138	0.121	0.365	0.087	0.063	0.038	0.052
1977-79	0.256	0.150	0.105	0.326	0.073	0.047	0.029	0.053
1977-80	0.259	0.163	0.096	0.300	0.063	0.037	0.022	0.055
1977-81	0.260	0.174	0.086	0.274	0.054	0.029	0,017	0.056
1977-82	0.261	0.184	0.076	0.248	0.040	0.021	0.014	0.058
1977-83	0.260	0.192	0.067	0.229	0.032	0.016	0.011	0.049
1977-84	0.268	0.203	0.065	0.224	0.026	0.013	0.009	0.051
1977-85	0.274	0.212	0.063	0.221	0.023	0.010	0.007	0.053
1977-86	0.282	0.219	0.064	0.224	0.024	0.010	0.007	0.053
long-run tax progressivity								
	I*	D^b	D^W	G1	G2	G3	G4	G5
1977-	0.056	0.536	0.482	0.040	0.020	0.022	0.016	0.035
1977-78	0.058	0.621	0.362	0.029	0.017	0.013	0.013	0.034
1977-79	0.051	0.686	0.333	0.026	0.012	0.010	0.008	0.026
1977-80	0.050	0.740	0.280	0.022	0.011	0.007	0.007	0.025
1977-81	0.049	0.776	0.224	0.018	0.008	0.004	0.005	0.022
1977-82	0.048	0.813	0.208	0.015	0.006	0.003	0.004	0.019
1977-83	0.046	0.848	0.174	0.013	0.004	0.002	0.003	0.019
1977-84	0.045	0.867	0.156	0.012	0.003	0.000	0.002	0.018
1977-85	0.045	0.844	0.133	0.011	0.002	0.000	0.001	0.016
1977-86	0.044	0.864	0.114	0.010	0.001	-0.001	0.000	0.016

TABLE 2C

1977-86, PRE AND POST-TAX INCOME STABILITY BY QUINTIL, γ= -1.0

	OVERALL	BETWEEN	WITHIN	GROUP1	GROUP2	GROUP3	GROUP4	GROUP5
pre-tax income stability								
1	1.000	0.468	0.532	1.000	1.000	1.000	1.000	1.000
2	0.949	0.522	0.427	0.900	0.861	0.859	0.841	0.826
3	0.925	0.558	0.368	0.839	0.745	0.753	0.692	0.772
4	0.908	0.586	0.322	0.776	0.655	0.627	0.592	0.740
5	0.893	0.612	0.282	0.719	0.563	0.521	0.478	0.716
6	0.877	0.633	0.243	0.668	0.424	0.390	0.404	0.694
7	0.860	0.648	0.212	0.625	0.335	0.291	0.329	0.621
8	0.855	0.660	0.195	0.606	0.264	0.218	0.253	0.608
9	0.847	0.665	0.183	0.588	0.217	0.165	0.176	0.599
10	0.836	0.660	0.176	0.576	0.204	0.132	0.142	0.574
post-tax income stability								
1	1.000	0.454	0.546	1.000	1.000	1.000	1.000	1.000
2	0.947	0.505	0.442	0.906	0.860	0.871	0.851	0.753
3	0.924	0.543	0.381	0.844	0.751	0.769	0.708	0.718
4	0.906	0.571	0.335	0.785	0.663	0.648	0.609	0.689
5	0.892	0.597	0.296	0.729	0.575	0.548	0.496	0.679
6	0.874	0.618	0.256	0.679	0.438	0.417	0.420	0.663
7	0.857	0.634	0.223	0.637	0.350	0.319	0.344	0.577
8	0.851	0.645	0.206	0.617	0.278	0.241	0.265	0.569
9	0.843	0.650	0.193	0.599	0.231	0.189	0.190	0.565
10	0.832	0.644	0.187	0.586	0.220	0.161	0.159	0.540

TABLE 3A
1977-86, PRE AND POST-TAX INEQUALITY
BY TAX TABLE USED, γ= -1.0

	OVERALL	BETWEEN	WITHIN	SINGLE	MARRIED	HEAD
pre-tax short-run inequality						
1977	0.323	0.037	0.286	0.431	0.234	0.338
1978	0.345	0.042	0.303	0.440	0.256	0.339
1979	0.330	0.03s	0.29s	0.443	0.250	0.249
1980	0.365	0.036	0.329	0.463	0.288	0.283
1981	0.367	0.035	0.332	0.480	0.285	0.302
1982	0.392	0.038	0.353	0.478	0.313	0.332
1983	0.386	0.035	0.351	0.482	0.313	0.247
1984	0.425	0.037	0.388	0.545	0.345	0.236
1985	0.459	0.043	0.417	0.570	0.374	0.286
1986	0.507	0.044	0.463	0.615	0.425	0.272
post-tax short-run inequality						
1977	0.266	0.033	0.233	0.370	0.183	0.294
1978	0.281	0.037	0.244	0.378	0.198	0.273
1979	0.285	0.033	0.251	0.385	0.210	0.208
1980	0.312	0.034	0.278	0.405	0.239	0.230
1981	0.311	0.034	0.277	0.414	0.234	0.245
1982	0.341	0.038	0.303	0.418	0.267	0.274
1983	0.337	0.034	0.303	0.428	0.267	0.207
1984	0.384	0.037	0.347	0.493	0.308	0.195
1985	0.416	0.042	0.374	0.519	0.334	0.245
1986	0.463	0.044	0.419	0.561	0.383	0.229
short-run tax progressivity						
	I*	D[b]	D"	G1	G2	G3
1977	0.057	0.070	0.930	0.061	0.051	0.044
1978	0.064	0.078	0.922	0.062	0.058	0.066
1979	0.04s	0.044	0.978	0.058	0.040	0.041
1980	0.053	0.038	0.962	0.058	0.049	0.053
1981	0.056	0.018	0.982	0.066	0.051	0.057
1982	0.051	0.000	0.980	0.060	0.046	0.058
1983	0.049	0.020	0.980	0.054	0.046	0.040
1984	0.041	0.000	1.000	0.052	0.037	0.041
1985	0.043	0.023	1.000	0.051	0.040	0.041
1986	0.044	0.000	1.000	0.054	0.042	0.043
Sample size	3033			575	2272	186

TABLE 3B
1977-86, PRE AND POST-TAX INEQUALITY
BY TAX TABLE USED, γ= -1.0

	OVERALL	BETWEEN	WITHIN	SINGLE	MARRIED	HEAD
pre-tax long-run inequality						
1977-	0.323	0.037	0.286	0.431	0.234	0.338
1977-78	0.317	0.040	0.277	0.417	0.228	0.323
1977-79	0.307	0.039	0.269	0.406	0.223	0.282
1977-80	0.309	0.038	0.271	0.405	0.226	0.274
1977-81	0.309	0.038	0.271	0.404	0.227	0.267
1977-82	0.309	0.039	0.270	0.396	0.229	0.263
1977-83	0.306	0.038	0.268	0.392	0.228	0.251
1977-84	0.313	0.039	0.275	0.402	0.235	0.245
1977-85	0.319	0.039	0.280	0.405	0.241	0.240
1977-86	0.326	0.040	0.286	0.411	0.247	0.235
post-tax long-run inequality						
1977-	0.266	0.033	0.233	0.370	0.183	0.294
1977-78	0.259	0.035	0.224	0.359	0.176	0.270
1977-79	0.256	0.035	0.221	0.352	0.177	0.234
1977-80	0.259	0.035	0.224	0.352	0.181	0.226
1977-81	0.260	0.035	0.224	0.351	0.183	0.218
1977-82	0.261	0.036	0.225	0.344	0.186	0.215
1977-83	0.260	0.036	0.224	0.342	0.186	0.205
1977-84	0.268	0.036	0.231	0.351	0.193	0.200
1977-85	0.274	0.037	0.237	0.356	0.200	0.197
1977-86	0.282	0.038	0.244	0.362	0.208	0.192
long-run tax progressivity						
	I^*	D^b	D^w	G1	G2	G 3
1977-	0.057	0.070	0.930	0.061	0.051	0.044
1977-78	0.058	0.086	0.914	0.058	0.052	0.053
1977-79	0.051	0.078	0.941	0.054	0.046	0.048
1977-80	0.050	0.060	0.940	0.053	0.045	0.048
1977-81	0.049	0.061	0.959	0.053	0.044	0.049
1977-82	0.048	0.063	0.938	0.052	0.043	0.048
1977-83	0.046	0.043	0.957	0.050	0.042	0.046
1977-84	0.045	0.067	0.978	0.051	0.042	0.045
1977-85	0.04s	0.044	0.956	0.049	0.041	0.043
1977-86	0.044	0.045	0.955	0.049	0.039	0.043

TABLE 3C
1977-86, PRE AND POST-TAX INCOME STABILITY
BY TAX TABLE USED, γ= -1.0

	OVERALL	BETWEEN	WITHIN	SINGLE	MARRIED	HEAD
pre-tax income stability						
1	1.000	0.115	0.885	1.000	1.000	1.000
2	0.949	0.119	0.830	0.956	0.932	0.953
3	0.925	0.116	0.809	0.928	0.904	0.913
4	0.908	0.112	0.795	0.912	0.882	0.906
5	0.893	0.110	0.783	0.895	0.866	0.883
6	0.876	0.109	0.767	0.873	0.848	0.860
7	0.860	0.107	0.753	0.859	0.829	0.847
8	0.855	0.105	0.750	0.854	0.822	0.842
9	0.847	0.105	0.742	0.841	0.815	0.829
10	0.836	0.103	0.733	0.831	0.803	0.814
post-tax income stability						
1	1.000	0.125	0.875	1.000	1.000	1.000
2	0.947	0.129	0.819	0.959	0.926	0.952
3	0.924	0.126	0.798	0.932	0.898	0.906
4	0.906	0.122	0.783	0.916	0.874	0.899
5	0.892	0.121	0.771	0.899	0.860	0.872
6	0.874	0.120	0.754	0.875	0.841	0.848
7	0.857	0.118	0.739	0.860	0.820	0.834
8	0.851	0.116	0.735	0.854	0.812	0.829
9	0.843	0.115	0.729	0.841	0.806	0.816
10	0.831	0.113	0.718	0.829	0.792	0.800

TABLE 4A
1977-86, PRE AND POST-TAX INEQUALITY
BY NUMBER OF EXEMPTIONS, γ= -1.0

	OVERALL	BETWEEN	WITHIN	GROUP1	GROUP2	GROUP3	GROUP4	GROUP5
pre-tax short-run inequality								
1977	0.322	0.014	0.309	0.251	0.433	0.195	0.343	0.178
1978	0.345	0.015	0.330	0.263	0.465	0.194	0.390	0.169
1979	0.330	0.011	0.319	0.225	0.448	0.198	0.382	0.172
1980	0.365	0.011	0.354	0.236	0.491	0.238	0.433	0.169
1981	0.367	0.011	0.357	0.254	0.502	0.224	0.424	0.188
1982	0.392	0.012	0.380	0.251	0.515	0.267	0.460	0.203
1983	0.386	0.010	0.376	0.273	0.515	0.311	0.397	0.211
1984	0.425	0.011	0.414	0.251	0.608	0.274	0.485	0.202
1985	0.459	0.013	0,446	0.286	0.607	0.323	0.550	0.209
1986	0.507	0.012	0.495	0.327	0.670	0.389	0.572	0.264
post-tax short-run inequality								
1977	0.266	0.012	0.254	0.207	0.366	0.154	0.277	0.139
1978	0.281	0.013	0.268	0.217	0.385	0.148	0.317	0.127
1979	0.285	0.011	0.274	0.190	0.387	0.163	0.336	0.138
1980	0.312	0.010	0,302	0.200	0.425	0.194	0.373	0.134
1981	0.311	0.011	0.300	0.214	0.433	0.178	0.357	0.149
1982	0.341	0.012	0.329	0.214	0.452	0.223	0.406	0.164
1983	0.337	0.010	0.327	0.237	0.458	0.264	0.342	0.172
1984	0.384	0.011	0.373	0.221	0.568	0.242	0.428	0.166
1985	0.416	0.013	0.402	0.253	0.567	0.283	0.490	0.172
1986	0.463	0.013	0.450	0.297	0.623	0.349	0.517	0.221
short-run tax progressivity								
	I*	D^b	D^w	G1	G2	G3	G4	G5
1977	0.056	0.036	0.982	0.044	0.067	0.041	0.066	0.039
1978	0.064	0.031	0.969	0.046	0.080	0.046	0.073	0.042
1979	0.045	0.000	1.000	0.035	0.061	0.035	0.046	0.034
1980	0.053	0.019	0.981	0.036	0.066	0.044	0.060	0.035
1981	0.056	0.000	1.018	0.040	0.069	0.046	0.067	0.039
1982	0.051	0.000	1.000	0.037	0.063	0.044	0.054	0.039
1983	0.049	0.000	1.000	0.036	0.057	0.047	0.055	0.039
1984	0.041	0.000	1.000	0.030	0.040	0.032	0.057	0.036
1985	0.043	0.000	1.023	0.033	0.040	0.040	0.060	0.037
1986	0.044	-0.023	1.023	0.030	0.047	0.040	0.055	0.043
Sample size 3033				384	737	610	804	498

TABLE 4B
1977-86, PRE AND POST-TAX INEQUALITY
BY NUMBER OF EXEMPTIONS, γ= -1.0

	OVERALL	BETWEEN	WITHIN	GROUP1	GROUP2	GROUP3	GROUP4	GROUP5
pre-tax long-run inequality								
1977-	0.322	0.014	0.309	0.251	0.433	0.195	0.343	0.178
1977-78	0.317	0.014	0.303	0.241	0.437	0.182	0.338	0.161
1977-79	0.307	0.013	0.294	0.222	0.429	0.175	0.335	0.155
1977-80	0.309	0.012	0.297	0.214	0.434	0.176	0.345	0.148
1977-81	0.309	0.012	0.297	0.209	0.437	0.176	0.345	0.148
1977-82	0.309	0.012	0.297	0.201	0.437	0.178	0.348	0.147
1977-83	0.306	0.011	0.295	0.198	0.436	0.185	0.336	0.148
1977-84	0.313	0.011	0.302	0.197	0.450	0.189	0.345	0.151
1977-85	0.319	0.012	0.307	0.193	0.458	0.195	0.355	0.150
1977-86	0.326	0.012	0.314	0.195	0.468	0.203	'0.363	0.154
post-tax long-run Inequality								
1977-	0.266	0.012	0.254	0.207	0.366	0.154	0.277	0.139
1977-78	0.259	0.013	0.246	0.199	0.366	0.142	0.272	0.122
1977-79	0.256	0.012	0.244	0.184	0.363	0.139	0.277	0.119
1977-80	0.259	0.011	0.248	0.178	0.369	0.141	0.287	0.116
1977-81	0.260	0.011	0.248	0.174	0.373	0.140	0.288	0.116
1977-82	0.261	0.011	0.249	0.168	0.374	0.143	0.292	0.116
1977-83	0.260	0.011	0.248	0.166	0.376	0.150	0.283	0.117
1977-84	0.268	0.011	0.257	0.166	0.390	0.156	0.292	0.120
1977-85	0.274	0.011	0.263	0.163	0.401	0.162	0.302	0.119
1977-86	0.282	0.012	0.271	0.165	0.412	0.170	0.311	0.123
long-run tax progressivity								
	I*	D^b	D^w	G1	G2	G3	G4	G5
1977-	0.056	0.036	0.982	0.044	0.067	0.041	0.066	0.039
1977-78	0.058	0.017	0.983	0.042	0.071	0.040	0.066	0.039
1977-79	0.051	0.020	0.980	0.038	0.066	0.036	0.058	0.036
1977-80	0.050	0.020	0.980	0.036	0.065	0.035	0.058	0.032
1977-81	0.049	0.020	1.000	0.035	0.064	0.036	0.057	0.032
1977-82	0.048	0.021	1.000	0.033	0.063	0.035	0.056	0.031
1977-83	0.046	0.000	1.022	0.032	0.060	0.035	0.053	0.031
1977-84	0.045	0.000	1.000	0.031	0.060	0.033	0.053	0.031
1977-85	0.045	0.022	0.978	0.030	0.057	0.033	0.053	0.031
1977-86	0.044	0.000	0.977	0.030	0.056	0.033	0.052	0.031

TABLE 4C
1977-86, PRE AND POST-TAX INCOME STABILITY
BY NUMBER OF EXEMPTIONS, γ= -1.0

	OVERALL	BETWEEN	WITHIN	GROUP1	GROUP2	GROUP3	GROUP4	GROUPS
pre-tax income stability								
1	1.000	0.043	0.957	1.000	1.000	1.000	1.000	1.000
2	0.949	0.042	0.907	0.938	0.973	0.936	0.924	0.926
3	0.925	0.039	0.886	0.903	0.957	0.893	0.901	0.895
4	0.908	0.036	0.871	0.878	0.944	0.854	0.890	0.862
5	0.893	0.035	0.859	0.851	0.935	0.836	0.875	0.846
6	0.877	0.034	0.843	0.819	0.921	0.814	0.861	0.821
7	0.860	0.032	0.828	0.795	0.912	0.798	0.837	0.809
8	0.855	0.031	0.824	0.788	0.905	0.795	0.832	0.810
9	0.847	0.031	0.816	0.761	0.900	0.789	0.827	0.796
10	0.836	0.030	0.806	0.744	0.890	0.775	0.818	0.785
post-tax income stability								
1	1.000	0.046	0.954	1.000	1.000	1.000	1.000	1.000
2	0.947	0.046	0.902	0.937	0.973	0.941	0.914	0.921
3	0.924	0.043	0.881	0.901	0.958	0.896	0.892	0.889
4	0.906	0.040	0.866	0.875	0.945	0.857	0.879	0.861
5	0.892	0.039	0.854	0.848	0.935	0.839	0.867	0.844
6	0.874	0.038	0.836	0.814	0.920	0.815	0.853	0.818
7	0.857	0.037	0.821	0.789	0.910	0.800	0.827	0.806
8	0.851	0.035	0.816	0.781	0.899	0.796	0.824	0.805
9	0.843	0.035	0.808	0.753	0.893	0.790	0.819	0.790
10	0.831	0.034	0.797	0.733	0.883	0.775	0.810	0.776